Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Spectrum Access System Initial Commercial Deployment Proposals	GN Docket No. 15-319

GOOGLE LLC PROPOSAL FOR FIELD TRIALS AND INITIAL COMMERCIAL DEPLOYMENT OF ITS SPECTRUM ACCESS SYSTEM

In response to the Commission's Public Notice (ICD PN), Google LLC (Google) proposes to commence field trials and Initial Commercial Deployment (ICD[1]) of its 3.5 GHz Citizens Broadband Radio Service (CBRS) Spectrum Access System (SAS).[2] Google is a conditionally-approved SAS Administrator[3] that has conducted numerous experiments in the 3.5 GHz band. Google also has been a leading contributor to the Commission's CBRS proceeding[4] and to the multi-stakeholder process that has created

[1] "ICD" as used herein refers to the combination of field trials and Initial Commercial Deployment.
[2] Public Notice, *Wireless Telecomms. Bureau and Office of Eng'g and Tech. Establish Procedure and Deadline for Filing Spectrum Access System Initial Commercial Deployment Proposals*, GN Docket No. 15-319 (rel. July 27, 2018) (ICD PN).
[3] *See Wireless Telecomms. Bureau and Office of Eng'g and Tech. Approve Seven Spectrum Spectrum Access System Adm'rs for the 3.5 GHz Band*, Public Notice, 31 FCC Rcd. 13355 (2016).
[4] *See, e.g.,* Comments of Google Inc. in GN 12-354 (filed July 14, 2014); Comments of Google LLC in GN Docket No. 17-258 (filed Dec. 28, 2017); Reply Comments of Google LLC in GN Docket No. 17-258 (filed Jan. 29, 2018); Letter from Austin C. Schlick, Director, Communications Law, Google LLC, to Marlene H. Dortch, Secretary, FCC, in GN Docket No. 17-258 (filed May 4, 2018).

the industry standards under which CBRS will operate.[5] Google looks forward to beginning ICD operations to bring the benefits of CBRS to businesses and consumers. In particular, Google believes that CBRS will play a crucial role in enabling and expanding 5G connectivity for all Americans, keeping the United States at the forefront of broadband innovation.

In addition to addressing specific requirements in Section III of the ICD PN, this Proposal provides details that will allow the Commission to assess Google's plans for ICD. While industry has made significant progress in ICD development, continued field trials, further laboratory testing, and early commercial operations will inform future plans. In addition to using the latest and best data to inform its ICD plans, Google plans to incorporate feedback from ecosystem partnerships as business plans and use cases for CBRS evolve. Thus, this proposal is a starting point that Google plans to refine with additional details over time. As improvements to its ICD are made, Google will keep the Commission apprised by timely filing of updates and amendments.[6] Such changes will allow the Commission to approve Google's ICD in light of the most current information, and enable Google to improve its testing methodologies to ensure continued compliance with the Part 96 rules while protecting incumbent operations in the 3.5 GHz band.

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[5] WInnForum Technical Specification TS-0112, *Requirements for Commercial Operation in the U.S. 3550-3700 MHz Citizens Broadband Radio Serv. Band* (May 2018), *available at* https://www.wirelessinnovation.org/specifications (WINNF-TS-0112) (Google chaired the committee that created this industry standard).

[6] *See* ICD PN ¶ 9 (stating that "applicants may amend and make supplemental filings after the initial submission of their proposal, as new information becomes available").

I. OVERVIEW

Google plans to partner or collaborate with equipment vendors, service providers, other SAS Administrators, and incumbents to deploy an end-to-end CBRS system for ICD that demonstrates full Part 96 compliance, including protection of incumbents from harmful interference. Google's SAS can support service anywhere in the United States.[7] For ICD, however, Google anticipates discrete deployments in various locations around the country. Locations will be selected based on the participants' joint business interests, as well as on the need to protect Tier 1 incumbent systems, including federal government users, grandfathered Fixed-Satellite Service (FSS) earth stations, and Grandfathered Wireless Protection Zones (GWPZs). Specific proposed deployments are presented in Annex A.

Through these initial deployments, Google will demonstrate:

- Secure and reliable communications between SAS and CBSDs to support registration, grants, heartbeats, measurement reporting, relinquishment, and deregistration;
- Secure and reliable communications between SAS and Domain Proxy;
- Secure and reliable communications with other SASs to support aggregate interference calculations, including exchange of CBSDs' physical installation parameters, information on active CBSD grants, and geographic descriptions of PAL Protection Areas (PPAs);[8]
- Secure and reliable connections to public FCC and NTIA databases to access information required for proper SAS operation;
- Support for registration of CBSDs by Certified Professional Installers;

[7] Per the U.S. Board on Geographic Names, "United States" refers to the 50 states and the District of Columbia. *See* https://www.usgs.gov/faqs/what-constitutes-united-states-what-are-official-definitions.
[8] Although PALs will not be auctioned and implemented in time for ICD, Google plans to demonstrate PAL-related capabilities by declaring certain CBSDs to be operating as PALs and protecting their operations accordingly.

- Implementation of defined interference protections for incumbents;
- Implementation of defined coverage and interference protections for Priority Access Licenses (PALs);
- In conjunction with other SAS Administrators, acceptance and investigation of reports of interference allegedly caused by CBSDs;
- The ability to expeditiously remedy any (unlikely) situations in which interference is caused by a malfunction of Google's SAS; and
- Support for portal-informed DPA activation.

Further details of the demonstration of these capabilities are provided below.

II. PLANNED OPERATIONS UNDER ICD

Google bases its site selection for ICD on a combination of factors, including the availability of local resources such as personnel, office space, and deployment locations for CBRS equipment, as well as proximity of Tier 1 incumbents, such as FSS earth station operators and Grandfathered Wireless Broadband Licensees (GWBLs) with which Google has existing working relationships. Site selection also reflects a desire to extend ICD to a variety of users in a range of environments, including urban, suburban, and rural areas. Site selection may be changed or refined based on the timing of ICD commencement.

Each site may be used to demonstrate a slightly different set of capabilities. For example, deployment at one site may demonstrate protection of nearby GWPZs. Deployment at another site may demonstrate protection of FSS. Yet another site may involve overlapping coverage with another SAS, allowing for full demonstration of SAS-to-SAS communications and coordination of aggregate interference. One site may host only a small number of outdoor Category B CBSDs (e.g., a small rural broadband

deployment), while another may host a large number of indoor Category A deployments (e.g., a large enterprise deployment in a major urban core).

Annex A provides the following information about each potential ICD site:

- Name of deployment
- Geographic description
- Schedule
- Maximum numbers of CBSDs by category
- Maximum number of EUDs
- Typical and maximum height of antennas
- CBSD vendor partners
- EUD vendor partners
- SAS collaborators
- Proximity to Tier 1 incumbents
- Incumbent collaborators (FSS, GWBL)
- Capabilities to be demonstrated

Some of the stated details are preliminary and subject to change as deployment plans are refined. Google expects to commence its ICD as described beginning in November 2018. Delays due to laboratory testing of SASs, FCC/DoD/NTIA review of test results, and issuance of a Public Notice announcing entities qualified to begin ICD may affect deployment opportunities, however.

III. RESPONSE TO SPECIFIC REQUIREMENTS IN THE ICD PN

Google's responses to specific requirements in the ICD PN,[9] in the context of the proposed ICD deployments, are provided in Annex B.

[9] *See* ICD PN ¶ 7.

IV. DATA ACQUISITION AND REPORTING

Substantial amounts of data on each aspect of SAS performance will be generated during ICD. In accordance with Part 96 rules,[10] Google will make all data stored or retained by the SAS available to authorized Commission personnel upon request. During ICD, additional diagnostic information may be generated, beyond the data that will be acquired during normal SAS operations. Google may make these data available to the Commission to increase the Commission's understanding of SAS functionality. Such disclosures would not include personally identifiable information or other sensitive user information the disclosure of which is restricted by law, by implementation of Commission requirements, or otherwise by Google policies or product terms. As feasible, data derived during ICD also may be used to enhance or modify internal testing mechanisms or scenarios to gain deeper or additional insights. Generally, data will be made available to the FCC in the form of text files (e.g., JSON, XML, KML, and/or CSV files), binary files (e.g., image and/or video files in common formats), or cloud-based files (e.g., Google Docs). Because files may be numerous and/or large, they will be distributed via a shared Google Drive folder with proper security protocols put in place, with access provided to appropriate FCC personnel.

There are no plans for non-Google employees to be granted direct access to the SAS. However, FCC personnel, working with Google employees, will be able to monitor, in real time, workings of the SAS under appropriate test scenarios conducted under ICD.

[10] 47 C.F.R. § 96.63(k).

As appropriate, such collaborations could be in-person at Google offices or conducted remotely via Google Hangouts or other teleconference facilities.

At the conclusion of ICD, Google will prepare and submit a report to the FCC on salient results from testing. The report will focus on the requirements from the ICD PN, addressing how Google's SAS and the associated CBRS ecosystem elements jointly demonstrate compliance with SAS-related Part 96 rules, particularly regarding protection of incumbent operations. Detailed results of each proposed deployment in Annex A will be presented to show Google's ability to fulfill one or more of the ICD PN requirements.

Google commits to working with the FCC throughout ICD to ensure that the data obtained, and the resultant report, allow for adequate FCC review of the trial deployments, laying the groundwork for full certification of Google as a SAS Administrator.

Respectfully submitted,

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Annex A

Planned Field Trial/ICD Deployments

[REDACTED]

Annex B

Responses to Requirements in the ICD PN

[REDACTED]

Annex C

Google's Prototype CPI Interface Portal

[REDACTED]